DOCUMENT RESUME

ED 222 774 CE 034 315

AUTHOR	Johnson, William B.; Ziegler, Charles F., Jr.
TITLE	A National Opinion Survey of Aviation Maintenance Training Regulations. Technical Report.
INSTITUTION	Illinois Univ., Urbana. Inst. of Aviation.
SPONS AGENCY	Aviation Technician Education Council, Houston, TX.
REPORT NO	ARL-TR82-2
PUB DATE	Oct 82
NOTE	65p.
PUB TYPE	Reports - Research/Technical (143)
EDRS PRICE	MF01/PC03 Plus Postage.
DESCRIPTORS	Administrator Attitudes; *Aviation Mechanics; Aviation Technology; Curriculum; Educational Needs; Educational Practices; *Federal Regulation; National Surveys; Postsecondary Education; *Program Effectiveness; Secondary Education; Teacher Attitudes; *Technical Education
IDENTIFIERS	Federal Aviation Administration; *Federal Aviation Regulation Part 147

ABSTRACT

A national survey examined the opinions of aircraft maintenance training school administrators and instructors concerning the suitability of Federal Aviation Regulation Part 147 (FAR 147) to regulate effectively today's training programs. Responding to the mail survey instrument were 163 persons representing 90 schools in 37 states. Included among the major views expressed by the respondents were the following: (1) instructors should be required to update their curriculum every 5 years and should operate under the inspection of the local General Aviation District Office; (2) the certification system should be modified to recognize rotary wing, avionics, and other specialists; (3) stricter certification procedures are necessary for aviation maintenance trainers, including minimum on-the-job experience and formal instruction on principles of educational techniques; (4) current written tests are inadequate and are compromised by the publication of tests and answers; (5) while most portions of the present curriculum are acceptable, certain subject areas are in need of content increase and other areas are in need of content decrease; and (6) the Federal Aviation Administration should conduct a comprehensive curriculum evaluation. (The survey instrument and a list of respondents are appended.) (MN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED222774

AVIATION RESEARCH LABORATORY

Institute of Aviation

University of Illinois at Urbana-Champaign
Willard Airport
Savoy, Illinois
61874

Technical Report

ARL-TR82-2

October 1982

A National Opinion Survey of Aviation Maintenance Training Regulations

William B. Johnson, Ph.D.*
Charles F. Ziegler, Jr.

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

This document has been reproduced as received from the person or organization originating it.

Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

Prepared for the

Aviation Technician Education Council

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

W B Johnson

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

*currently on leave of absence to Search Technology, Inc., Atlanta, Georgia

CE 034 315

EXECUTIVE SUMMARY

Under the sponsorship of the Aviation Technician Education Council, a mail survey was conducted to elicit opinions from aircraft maintenance training school administrators and instructors about the suitability of Federal Aviation Regulation Part 147 to effectively regulate today's training programs. The study identified the strengths and weaknesses of the regulation and noted particular curricular subject areas that need immediate revision. A majority felt that the Federal Aviation Administration should conduct further evaluation of the maintenance training regulations. The survey questionnaire and list of respondents are included.

This report has been reviewed and is approved for publication, October, 1982.

Henry L. Taylor, Acting Head
Aviation Research Laboratory and
Director, Institute of Aviation
University of Illinois at Urbana-Champaign

ACKNOWLEDGEMENTS

The authors acknowledge the Aviation Technician Education Council, the University of Illinois Aviation Research Laboratory and Graduate Research Board, and Search Technology for providing funding for this project. The Federal Aviation Administration provided valuable guidance and all copies of FAR Part 147 which were included in the questionnaire mailings.

CONTENTS

INTRODUCTION 2

SURVEY METHOD 4

FINDINGS 5

Respondent Profile 5

Specific FAR 147 Sections 6

The Curricular Content 8

Additional Subjects 9

Subject Content 9

Miscellaneous Curricula Responses 11

RELATED MAINTENANCE TRAINING ISSUES 12

CONCLUSION AND RECOMMENDATIONS 14

REFERENCES 17

APPENDICES 18

INTRODUCTION

Are today's Airframe and Powerplant (A&P) training programs preparing technicians to enter the Aviation work force? Is Federal Aviation Regulation Part 147 (FAR 147) addressing the important issues in technician training? Has the time arrived for a major revision of FAR 147? These are a few of the issues addressed in a 1982 study completed for the Aviation Technician Education Council (ATEC) by the University of Illinois Aviation Research Laboratory.

It was 1970 when the National Study of the Aviation Mechanics Occupation, Phase III (Allen, D. and Bowers, W. K., 1970) was completed. The data collected for the study is nearly fifteen years old. Yet this data is the underlying structure for today's aircraft maintenance curriculum as regulated by FAR 147. The aviation industry and the state of the art of aircraft design and maintenance have certainly changed in the last decade and a half. Fifteen years ago the major challenge in maintenance was coping with the size of the new 747. Today's technician is faced with the solid state complexity of the 757, 767, and other new generation aircraft.

Given that the aviation industry has changed, it would follow that the training of aviation maintenance technicians may also need appropriate modification. Furthermore, the regulations governing such training, specifically FAR 147, may also need updating. Generally, regulations are considered for modification when there is a question of "public safety." The public has been

slow, however, to demand such change in FAR 147. ATEC itself, representing the majority of maintenance training programs, has been unable to form a collective opinion about FAR 147.

At the 1982 national conference in Boston, ATEC decided that the time had come to poll its membership about FAR 147. It was decided that the opinion of all schools operating under FAR 147 should be determined. ATEC realized that there were at least two major populations that understood FAR 147 and the current status of maintenance training: (1) aviation maintenance educators, and (2) the aircraft maintenance industry itself. It was understood that the initial step in studying FAR 147 would be a survey of school opinion. Dr. William B. Johnson and Mr. Charles F. Ziegler, Jr. of the University of Illinois submitted a proposal to conduct this initial opinion survey of aviation educators and ATEC agreed to provide support for this research.

The primary objective of the study was to determine the opinions of school administrators and instructors about the suitability of FAR 147 for regulating today's Airframe and Powerplant maintenance training programs. In addition, the study was designed to identify specific subsections of the regulation that require further evaluation and perhaps revision or elimination, as well as specific curricular content that might need modification. Finally, the opinion survey polled educators about the need for a major curriculum study and provided for comments about maintenance training and certification.

SURVEY METHOD

The construction of the mail survey questionnaire was based on previous experience (Johnson and Sredl, 1979, a & b) and the involvement of many groups, including the ATEC Board of Directors and Washington representatives of the Federal Aviation Administration (FAA). The research instrument, which is included in Appendix A, was revised numerous times and pilot tested prior to the mass mailing.

The mailing, which went out first class on June 12, 1982, was comprised of a cover letter, the questionnaire, a complete copy of FAR 147, and a stamped return envelope. A return deadline of July 9 was stamped on the outside of the envelope. A reminder post card was mailed to nonrespondents on July 2. The mailing list included all certified A&P schools and all ATEC members. The questionnaire was mailed to 256 persons. The number returned by the extended deadline (July 19) was 163, yielding a response rate of nearly 64 percent. The schools responding to the survey are listed in Appendix B.

FINDINGS

Respondent Profile

The group of 163 respondents represented 90 schools in 37 states. The average age of the respondents was 46, with the median age being 47. Ninety-three percent of the respondents had the Airframe and Powerplant mechanic license, with the average number of years as an A&P technician being 20. Fifty-seven percent had the Inspection Authorization (IA) and 60 percent were Designated Mechanical Examiners (DME). The respondents included administrators (18 percent), instructors (67 percent), and persons with combined administrative and instructional responsibilities (15 percent). Eighty-three percent of the respondents were members of ATEC.

Table 1 presents the percentage of respondents by school type. With the exception of the Two Year College, which represented 36 percent of the respondents, all school types had approximately equal representation.

Table 1 Organization Type Report in Percent of Respondents

SCHOOL TYPE	PERCENT OF RESPONDENTS
Private Vocational School	13%
High School	15%
Two Year College	36%
Four Year College	19%
Public VOTEC	16%
Other	1%

Specific FAR 147 Sections

Appendix A provides the percentage response to each question on the survey instrument. In addition, the mean and median responses for each question are also listed. For the sake of brevity, this report will discuss primarily those questions with which at least 60 percent of the respondents agreed or disagreed.

Sixty-nine percent of the respondents felt that schools should be required to "periodically update the curricula, and apply for reapproval." The number of years for such periodic review ranged from 1 to 10, with an average of 5.3 years. This finding was confirmed by question no. 6, a & b, under section 147.38. Sixty-eight percent said "no" to a biannual reevaluation; yet 78 percent said "yes" to a five-year review schedule.

The second question in Section II of the questionnaire addressed FAR 147.11, regarding the need for additional ratings in such areas as helicopters, avionics, and turbine engines. Sixty-nine percent of the respondents felt that some type of specialized ratings is necessary. In Section III of the survey, this question was made rating specific with questions 16, 17, and 18. Fifty-nine percent felt that a rotary wing specialized rating is necessary. Forty-nine percent disagreed with the need for a turbine engine mechanics rating, while 56 percent disagreed wih the need for a composite construction rating. There were numerous miscellaneous comments about additional ratings.

Written suggestions offered in this area ranged from the creation of a large aircraft vs. small aircraft certificate to a fixed wing vs. rotary wing certificate. A few respondents felt that aviation employers should be responsible for the additional certification. The following comment illustrates this feeling: "Pilots earn additional ratings for larger equipment, mechanics should be required to do the same."

The issue of "1900 hours of instruction" was presented in questions 3 and 20. Seventy-two percent of the respondents disagreed that the instructional time should be shortened. Only 4 percent thought that it should be lengthened. The calculation of the average value of the five point scale responses for questions 3 and 20 yields values of 3.8 and 2.9, respectively. A value of 3.0 indicates an "indifferent" opinion, while 4.0 indicates an opinion of "slightly disagree." When the average response values are then analyzed, it appears that 1900 hours may very well be an appropriate requirement for the minimum hours of instruction. There were many miscellaneous responses regarding instructional time requirements. The variety of comments in this area suggests that opinion is based on the type of school. Four-year colleges seem to favor a competency-based curriculum, whereas high schools or private vocational schools tend to prefer the 1900 hours as a minimum instructional time.

Aircraft maintenance educators favor strict requirements for those in their own ranks. Ninety-three percent felt that instructors should have at least two years of field experience.

required to have education theory courses to better prepare them for teaching.

Question no. 7 addressed FAR 147.38a, concerning the quality of instruction. The goal of this question was to assess the value of the national norm in determining the quality of a school's program. Seventy-nine percent of the respondents discounted the value of national norms. Again, there were many written responses that were very negative about the present written exams and about public access to the questions. While the increased control of the oral/practical exam is a step in the right direction, many respondents voiced the opinion that there is still room for improvement concerning the written exams.

In question no. 8, respondents were quite positive about the value of the FAA General Aviation District Office (GADO) inspection of A&P schools operating under FAR 147. Seventy-seven percent saw this inspection as a necessary check on a school's program. One respondent felt that there should be FAA inspectors whose sole purpose is school inspection. This could serve to standardize the inspection procedure and to relieve GADO of responsibility for school programs.

The Curricular Content

Question 9, 11, 12, and 13 addressed the content of the curricula in the General, Airframe, and Powerplant areas. The respondents were given the choice of increasing, decreasing, or not changing the content. The pilot test demonstrated that, in most cases, an increase or decrease in content was followed by a

similar trend in level. Conseqently, "content" was used in the questionnaire rather than "level" for the sake of simplicity.

Additional Subjects. Question 9 sought to identify curricula that are in need of additional subjects. Table 2 indicates respondents' opinions on the need for additional subjects in each of the three curricula. The percentage of respondents that agreed with the need for additional subjects ranged from 29 percent (General Curriculum) to 45 percent (Airframe Curriculum). Although the majority of the respondents failed to indicate a need for additional subjects, numerous written comments called for the inclusion of new technology in a particular curriculum, by modifying the content of an existing subject.

Table 2 Percent Response--Need for Additional Subjects*

CURRICULUM	AGREE	INDIFFERENT	DISAGREE
General Curriculum (FAR 147, Appendix B)	29%	20%	49%
Airframe Curriculum (FAR 147, Appendix C)	45%	20%	36%
Powerplant Curriculum (FAR 147, Appendix D)	38%	23%	39%

* Totals may not add up to 100% due to rounding error.

Subject Content. Questions 11, 12, and 13 were used to determine if any existing subjects are in need of content increase or decrease. Opinions concerning the need for content increase or decrease for each of the 43 subjects in the three

curricula revealed only two subjects in need of a content change (see Table 3). Sixty-nine percent of the respondents were of the opinion that the subject of Wood Structures in the Airframe Curriculum needs a decrease in its content. Only one percent of the respondents felt that its content should be increased. Written comments indicated less of a need for instruction in Wood Structures due to modern aircraft construction materials. Sixty-six percent of the respondents felt that the subject of Turbine Engines in the Powerplant Curriculum is in need of a content increase, while only one percent felt it should have its content reduced.

Table 3 Subject Content Percent Response

CURRICULUM/SUBJECT	INCREASE CONTENT	DECREASE CONTENT
Airframe/Wood Structures	1%	69%
Powerplant/Turbine Engines	66%	1%

In addition to the over 60 percent of responses which favored increasing the content of Turbine Engines and decreasing the content of Wood Structures, four subjects were viewed to be in need of a content increase or decrease by over 50 percent of the respondents. Subjects to be increased in content were: Aircraft Electrical Systems (57%), Airframe Inspection (52%), and Basic Electricity (51%). Fifty-four percent of the respondents called for a content decrease in Aircraft Covering.

Miscellaneous Curricula Responses. There were 125 comments

received in response to the curricula related questions. These comments are included in Appendix C. While it is unfair to argue from a specific example to the general case, we have chosen to present a few insightful remarks. Under Airframe: "Dope and Fabric should be elective courses"; "Wood structures do not apply to today's aircraft"; ". . . I would hate to think we are producing technicians for antique aircraft rebuilding and for skills that are no longer required by the industry"; "Increase emphasis on bonded structures, composition materials and special fasteners. . ."

The powerplant replies had an anti-radial/pro-turbine engine theme: "Eliminate requirements for 14 cylinder or larger radial engine . . ."; "Let's get up-to-date with turbochargers, turboprops, and more turbine engines"; "More turbine and heavier engine electrical is needed."

There were also numerous remarks that would be applicable to all instructional areas: "How about courses in written and verbal communication?" "More electronics, troubleshooting, and complex circuit analysis"; "More computer familiarization"; "After a visit to Boeing, I feel there should be some introductory course given in computer operation or programming."

RELATED MAINTENANCE TRAINING ISSUES

The final section of the questionnaire had the twofold objective of validating a few previous questions and eliciting additional opinions about other topics not directly addressed in FAR 147. As with the first two sections, this portion also prompted numerous remarks at the questionnaire's end.

On question no. 14, seventy percent of the respondents felt that there is a shortage of properly trained and qualified mechanics. In responding to question no. 15, fifty-five percent agreed that the graduate is not adequately qualified for today's aircraft. The many comments related to these topics emphasized that an A&P license is merely a ticket to continue learning with proper on-the-job experience.

Perhaps one of the most important questions on the survey was question no. 22 about the need for an FAA sponsored review of FAR 147. Sixty-seven percent of the respondents answered affirmatively to the question. Written comments further reinforced the response; however, there were also many comments stating that the Allen Study remains a reasonable guideline for the A&P curriculum. In any case, a clear majority of respondents (69%) answered affirmatively to question no. 3, indicating that any modification to FAR 147 should allow more flexibility into the curriculum.

Question no. 25, which elicited opinions about areas where changes are needed in FAR Part 147, resulted in 35 pages of

written responses. The responses have been categorized as shown in Table 4 and are included in full in Appendix C.

Table 4 Number and Category of Responses to Question no. 25

CATEGORIES	NUMBER OF RESPONSES
1. Ratings and Certification	9
2. Written Exams	19
3. Curriculum: Hours, Content, Intent and the Allen Study	80
4. Teaching Environment: Methods, Equipment, Class Size, Instructor Qualifications	27
5. FAR 147: Specific Changes	30
6. Level and Content: Decrease	41
7. Level and Content: Increase	67
8. Miscellaneous	11
Total Responses to Question no. 25	284

The variety and length of responses ran the gamut from general negativism to very positive remarks praising the present regulations. Many of the sharply critical remarks were accompanied by ideas for improvement. A few of the comments were about the questionnaire itself. These remarks were generally positive and represented the general opinion that the survey was asking the "right questions."

CONCLUSION AND RECOMMENDATIONS

The survey response rate was nearly 64 percent of the combined group of certified A&P schools and ATEC members. This size sample permits us to assume that the findings are indeed representative of the population of A&P schools. This survey reinforced the original hypothesis that there is significant variance in educators' opinions about FAR 147. The survey did, however, identify certain portions of FAR 147 that were acceptable, or unacceptable, to the majority.

Educators felt that they should be required to update their curriculum every five years and operate under the inspection of the local General Aviation District Office. Educators were generally satisfied with the regulations related to GADO and the A&P schools.

Educators felt that the certification system should be modified to recognize rotary wing, avionics, and other specialists.

Educators felt the need to require stricter certification in their own ranks. The stricter rule might include a minimum requirement for on-the-job A&P experience and formal instruction on principles of education and on teaching techniques.

A large majority of the respondents felt that the written tests were inadequate and were compromised by the publication of the test and answers. The FAA testing norms were no longer considered to be an adequate measure of program quality.

Most portions of the present curriculum were considered to be acceptable. However, certain subject areas such as Wood Structures and Aircraft Covering were felt to be in need of content decrease. Among the areas selected for content increase were Turbine Engines, Airframe Electrical Systems, Airframe Inspection, and Basic Electricity. Educators seemed to feel that a new system of regulation should permit greater flexibility in A&P curricula.

Finally, a large majority felt that the FAA should conduct a curriculum evaluation equal in scope to the Allen Study done in the late sixties. Numerous respondents felt that the current opinion survey was an excellent step in the right direction and should lay the foundation for the next research phase.

The educators surveyed believed that FAR 147 remains a viable framework for the regulation of A&P curricula, although they identified certain areas as in need of change as soon as possible. Is this opinion shared by those who employ new A&P school graduates? Is the newly certified maintenance technician actually employable and qualified to service modern aircraft systems? What does the industry need in terms of personnel for the workforce of the future? These are a few of the major questions that should be asked of aviation maintenance employers.

The next step should be a study of the Aviation Industry to determine its perception of the A&P school graduate. Such a study could determine if there are perceived problems and make recommendations for improvement. The educators, i.e., ATEC and the University of Illinois, sponsored the current study. The FAA was very helpful in the development of the questionnaire and in

the donation of many copies of FAR 147. The next phase of this continuing research should be funded by a group other than ATEC or a University. The primary benefactors of improved A&P training are this nation's flying public and the aviation industry itself. For that reason, it is recommended that the next phase be cooperatively shared by the FAA and groups representing the industry-at-large. The latter group should include general aviation, the regional airlines and the major and national airlines. The results of this second phase combined with the results of the present study should permit the FAA to evaluate how effectively FAR 147 presently meets the aviation maintenance needs and how well it will meet these needs in the future.

REFERENCES

Allen, David & Bowers, William K., A National study of the aviation mechanics occupation, phase III (DOT-FAA OE-85-043). Washington, D.C.: Federal Aviation Administration, Flight Standards Office, August 1970.

Johnson, W.B., & Sredl, H.S., A follow-up study of aviation graduates. Aviation/Space, 1979, 6 (4), 46-47. (a)

Johnson, W.B. & Sredl, H.S., Institute of Aviation graduate survey: 1950-1978. Urbana, IL: University of Illinois, 1979. (ERIC Document Reproduction Service No. ED171924). (b)

APPENDIX A: Questionnaire with percent responses and mean/median

MEAN
MEDIAN

UNIVERSITY OF ILLINOIS
AVIATION RESEARCH LABORATORY

1-3

AVIATION TECHNICIAN EDUCATION COUNCIL

FAR 147 SURVEY

SECTION I. - RESPONDENT PROFILE

Name (optional)_____

Age 46/47 4-5

Zip Code (geographical data)_____ 6-10

RATINGS HELD (circle each number that applies)

Airframe. 93%	1	years held 19/19	11-13
Powerplant. 93%	2	years held 19/20	14-16
Inspection Authorization. 35%	3	years held 11/10	17-19
IME . . . 60%	4	years held 8/8	20-22
FCC 2nd Class . . 7%	5	years held 9/6	23-25
None. . . 3%	6		26

YOUR PRIMARY RESPONSIBILITY FOR A&P TRAINING (circle one)

Administrative. 18%	1	] 15%	27
Instruction . . . 67%	2		

(circle all that apply)

Airframe.	1	51%	28
Powerplant.	2	47%	29
General	3	47%	30

Other (specify)_____

YOUR ORGANIZATION TYPE (circle one)

Private Vocational School . . .	1	13%	
High School	2	15%	
2 Year College.	3	36%	31
4 Year College.	4	19%	
Other (specify) Public VOTEC		16%	

What is the FAA approved enrollment size of your institution? 233/150 32-34

Does your institution belong to ATEC? Yes 1 No 2 Unsure 8 35

83% 6% 6%

SECTION II. - SPECIFIC 147 SECTIONS

The following portions of FAR 147 appear to be most controversial. Please circle the one number which best describes your level of agreement with each statement.

	Strongly Agree	Agree	Indifferent	Disagree	Strongly Disagree	
1. 147.7 Duration of Certificates						
a. A&P schools should be required to periodically update curricula and apply for reapproval by the FAA.						36
b. How often should they be reapproved? 5.3/5.0 yr.	19%	50%	8%	14%	10%	37-38
2. 147.11 Ratings 2.5/2.1						
Additional specialized ratings (e.g., helicopter, avionics, turbine mechanic) are needed after a basic A&P license is obtained. 2.4/2.1	21%	48%	7%	12%	12%	39
3. 147.21 General Curriculum Requirements						
a. The instructional time requirement should be shortened from the present 1900 hours. 3.8/4.1	7%	10%	10%	39%	33%	40
b. The instructional time requirement should be replaced with a system of proficiency evaluation in the various subject areas. 2.9/2.9	21%	26%	8%	26%	19%	41
4. 147.33 Records						
The amount of individual record keeping required for each student is excessive. 3.0/3.1	13%	25%	18%	38%	7%	42
5. 147.36 Maintenance of Instructor Requirements						
a. A&P instructors should have 2 or more years of field experience. 1.5/1.2	63%	30%	3%	3%	1%	43
b. A&P instructors should be required to have education theory courses in preparation for better teaching. 2.1/1.8	33%	44%	9%	10%	4%	44

				Strongly Agree	Agree	Indifferent	Disagree	Strongly Disagree	
6.	147.38 Maintenance of Curriculum Requirements Schools should be required to complete a formal evaluation of their curriculum: *(please specify preference to both questions)*								
	a. Every 2 years	3.7/3.9	68% No	5%	14%	12%	47%	21%	45
	b. Every 5 years	2.2/2.0	78% Yes	22%	56%	6%	13%	4%	46
7.	147.38a Quality of Instruction 4.0/4.2 In light of the fact that the FAA exam question pool is now published, the FAA national nroms remain the best way to accurately determine the quality of a school's instruction.			3%	11%	8%	40%	39%	47
8.	147.43 Inspection 79% No The FAA GADO inspection is a necessary check on a school's program.	2.1/2.0	77% Yes	23%	54%	10%	12%	2%	48
9.	Appendix B, C, and D (See Questions 11, 12, & 13)								
	a. Additional subjects should be included in the General Curriculum (Appendix B)	3.1/3.5		7%	22%	20%	44%	5%	49
	b. Additional subjects should be included in the Airframe Curriculum (Appendix C)	2.9/2.8		10%	35%	20%	31%	5%	50
	c. Additional subjects should be included in the Powerplant Curriculum (Appendix D)	2.9/3.0		10%	28%	23%	36%	3%	51
10.	Curricula requirements (like 147 Appendix B, C, & D) should be listed in an easily modifiable Advisory Circular rather than in the Regulation.	2.6/2.3		22%	33%	16%	17%	12%	52

For questions 11, 12, & 13, please circle the number that best reflects your opinions about the content of the following subjects.

Subject Content

			No Opinion	Decrease Content	No Change	Increase Content	
11.	Appendix B General Curriculum Subjects						
	A. Basic Electricity	2.5/2.5	8	3%	46%	51%	53
	B. Aircraft Drawings	2.0/2.0	8	7%	83%	9%	54
	C. Weight and Balance	2.1/2.1	8	2%	87%	11%	55
	D. Fluid Lines and Fittings	2.1/2.1	8	2%	82%	16%	56
	E. Materials and Processes	2.1/2.1	8	13%	60%	27%	57
	F. Ground Operation and Servicing	2.2/2.1	8	4%	74%	22%	58
	G. Cleaning and Corrosion Control	2.2/2.1	8	3%	74%	23%	59
	H. Mathematics	2.2/2.2	8	10%	61%	29%	60
	I. Maintenance Forms and Records	2.4/2.3	8	1%	58%	41%	61
	J. Basic Physics	2.2/2.1	8	7%	70%	23%	62
	K. Maintenance Publications	2.4/2.3	8	1%	59%	41%	63
	L. Mechanic Privileges and Limitations	2.3/2.2	8	2%	66%	32%	64
12.	Appendix C Airframe Curriculum Subjects						
	I. Airframe Structures						
	A. Wood Structures	1.3/1.2	8	69%	31%	1%	65
	B. Aircraft Covering	1.5/1.4	8	54%	41%	6%	66
	C. Aircraft Finishes	2.1/2.1	8	14%	61%	25%	67
	D. Sheet Metal Structures	2.5/2.5	8	1%	49%	49%	68
	E. Welding	1.7/1.7	8	36%	60%	5%	69
	F. Assembly and Rigging	2.3/2.	8	2%	66%	32%	70
	G. Airframe Inspection	2.5/2.5	8	0%	48%	52%	71

			Subject Content				
			No Opinion	Decrease Content	No Change	Increase Content	
	II. Airframe Systems and Components						
A.	Aircraft Landing Gear Systems	2.2/2.1	8	1%	83%	16%	72
B.	Hydraulic and Pneumatic Power Systems	2.2/2.2	8	3%	72%	25%	73
C.	Cabin Atmosphere Control Systems	2.3/2.2	8	3%	64%	33%	74
D.	Aircraft Instrument Systems	2.1/2.1	8	3%	75%	23%	75
E.	Communication and Navigation Systems	2.3/2.2	8	6%	60%	34%	76
F.	Aircraft Fuel Systems	2.1/2.1	8	3%	84%	13%	77
G.	Aircraft Electrical Systems	2.6/2.6	8	0%	43%	57%	78 79/Bk 80/1
H.	Position and Warning Systems	2.1/2.1	8	3%	83%	14%	1-3 Dup 4
I.	Ice and Rain Control Systems	2.1/2.1	8	3%	86%	12%	5
J.	Fire Protection Systems	2.1/2.0	8	5%	85%	11%	6
13.	Appendix D Powerplant Curriculum Subjects						
	I. Powerplant Theory and Maintenance						
A.	Reciprocating Engines	1.9/1.9	8	20%	75%	6%	7
B.	Turbine Engines	2.7/2.7	8	1%	33%	66%	8
C.	Engine Inspection	2.5/2.4	8	0%	52%	47%	9
	II. Powerplant Systems and Components						
A.	Engine Instrument Systems	2.1/2.1	8	5%	79%	16%	10
B.	Engine Fire Protection Systems	2.1/2.0	8	7%	81%	12%	11
C.	Engine Electrical Systems	2.4/2.3	8	1%	60%	40%	12
D.	Lubrication Systems	2.0/2.0	8	6%	88%	6%	13
E.	Ignition Systems	2.2/2.1	8	3%	78%	19%	14
F.	Fuel Metering Systems	2.2/2.2	8	7%	63%	30%	15
G.	Engine Fuel Systems	2.1/2.1	8	5%	81%	14%	16
H.	Induction Systems	2.0/2.0	8	7%	83%	11%	17
I.	Engine Cooling Systems	2.0/2.0	8	8%	87%	6%	18
J.	Engine Exhaust Systems	2.0/2.0	8	7%	86%	7%	19
K.	Propellers	2.1/2.0	8	12%	70%	18%	20

SECTION III. - RELATED MAINTENANCE TRAINING ISSUES *Please circle the number that best describes your level of agreement with each statement.*		Strongly Agree	Agree	Indifferent	Disagree	Strongly Disagree	
14.	There is a shortage of properly trained and qualified A&P mechanics. 2.3/2.1 70% Agree	17%	53%	13%	15%	2%	21
15.	Aircraft mechanics that are graduated from A&P schools are not adequately qualified for today's aircraft. 2.7/2.4 55%	14%	41%	6%	35%	4%	22
16.	A specialized rating for helicopters (rotarywing) is needed. 2.6/2.3	20%	39%	10%	21%	11%	23
17.	A specialized rating for turbine engines is needed. 3.1/3.4	10%	30%	11%	36%	13%	24
18.	A specialized rating for bonded and composite construction is needed. 3.3/3.7	9%	19%	15%	42%	14%	25
19.	The instructional requirements for A&P mechanics should be specified by the aviation industry instead of the FAA. 2.9/2.7	18%	31%	11%	26%	14%	26
20.	More than the minimum 1900 hours of instruction is required to train a beginning A&P mechanic. 2.9/3.1	16%	25%	13%	34%	10%	27

		Strongly Agree	Agree	Indifferent.	Disagree	Strongly Disagree	
21.	School administrators and instructors understand the needs of industry and structure A&P training accordingly. 2.9/2.5	8%	42%	14%	28%	8%	28
22.	The FAA should sponsor a review of FAR 147 similar to the Allen Study of 1969-1970. 2.3/2.1 67% Yes	29%	38%	14%	16%	3%	29
23.	A new regulation, similar to FAR 147, should allow more flexibility of approved curricula. 2.3/2.0 69%	30%	39%	9%	17%	5%	30
24.	FAR 65.101 has been changed to allow schools to train repairmen. Our program is interested in providing repairman training. 2.9/2.9	8%	28%	32%	24%	8%	31

25. Indicate those areas where changes in FAR 147 are most needed and why:

1. Comments Received: 284
   35 Typed Pages
   See Table 4 in Text — 32-33
2. — 34-35
3. — 36-37 38-79/Bk 80/2

Your general comments are welcome (if more space is needed, use an attachment).

Thank you for your help.

Appendix B

List of Schools Responding by July 19, 1982(Alphabetical order by States)

Anchorage Comm. College
Aviation Main. Tech. School
2408 East 5th Avenue
Anchorage, AK 99502

North Star Borough
School of Aviation
3750 Geist Rd.
Fairbanks, AK 99071

AL. Aviation &
Tech. College
P.O. Box 1088
Ozark, AL 36330

Southern State College
Box 3048
East Camden, AR 71701

Cochise College
Drawer A
Douglas, AZ 85607

Los Angeles Trade Tech. College
9700 S. Sepulveda
Los Angeles, CA 90045

Orange Coast College
2701 Fairview Rd.
Costa Mesa, CA 92626

College of San Mateo
1700 W. Hillsdale Blvd.
San Mateo, CA 94403

Deuel Vocational Inst.
P.O. Box 400
Tracy, CA 95376

Gavilan College
2310 San Felipe Rd.
Hollister, CA 95023

Solana Community College
P.O. Box 246
Suisun City, CA 94585

Glendale Community Col. Dist.
1500 North Verdugo
Glendale, CA 94110

Reedley College
Reed & Manning Ave.
Reedley, CA 93654

Sacramento City College
3835 Freeport Blvd.
Sacramento, CA 95822

San Bernadino Valley College
701 S. Mt. Vernon Ave.
San Bernardino, CA 92410

San Francisco International
Airport School
San Francisco Int'l AP
San Francisco, CA 94128

Harvard H. Ellis Regional
Voc. Tech. School
P.O. Box 149 Maple St.
Danielson, CT 06239

Colorado Aero. Tech. Inc.
10851 West 120th
Broomfield, CO 80020

Emily Griffith Oppor. School
Aircraft Training Center
8301 Montview Blvd.
Denver, CO 80220

National Aviation Academy
Aviation Main. Tech. School
St. Petersburg/Clearwater AP
Clearwater, FL 33520

George T. Baker Aviation School
3275 NW 42nd Ave.
Miami, FL 33142

Rice Aviation of Florida
7191 Pembroke Rd.
Pembroke Pines, FL 33024

Trans. Tech. Broward
Community College
7200 Holly Blvd.
Pembroke Pines, FL 33024

Lewis M. Lively Area Voc.
Tech. Aviation School
500 N. Appleyard
Tallahassee, FL 32304

Atlanta Area Technical
School
1560 Stewart Ave., SW
Atlanta, GA 30310

Iowa Western Comm. College
2700 College Rd.
Council Bluff, IA 51501

Indian Hill
Community College
Ottumwa Industrial Airport
Ottumwa, IA 52501

Aero-Technicians, Inc.
P.O. Box 7
Rexburg Airport
Rexburg, ID 83440

Dupage Area Voc.
Educational Authority
301 North Swift Rd.
Addison, IL 60101

Southern Illinois University
Southern Illinois Airport
Carbondale, IL 62901

Parks College
Saint Louis University
Cahokia, IL 62206

Belleville Area College
Aviaiton Maintenance Tech.
3431 Mississippi Ave.
Cahokia, IL 62206

Chicago Voc. School
10656 Ave. B
Chicago, IL 60617

Lewis University
Rt. 53
Romeville, IL 60441

Institute of Aviation
University of Illinois-
Willard Airport
Savoy, IL 61874

Aviation Technology Dept.
Purdue University
Purdue Airport
Lafayette, IN 47906

Vincennes University
Vincennes, IN 47591

Wichita Area Vocational
Technical School
301 South Grove
Wichita, KS 67211

Sommerset State Vocational
Technical School
R.R. 2, Box 512 A
Sommerset, KY 42501

Delgado Junior College
615 City Park Ave.
New Orleans, LA 70601

Frederick Community College
7932 Oppossumtown Pike
Frederick, MD 21701

Air-Tech. Inc.
16 Central Ave.
Limerick, ME 04048

Andrews University
Berrien Springs, MI 49103

Aero Mechanics Vocational
High School
10200 Erwin
Detroit, MI 48234

Southern Michigan University
Cherry Grove Rd.
Dowagiac, MI 49047

Western Michigan University
Municipal Airport
Aviation Bldg.
Kalamazoo, MI 49001

Lansing Community College
Capital City Airport
3428 W. Hangar Dr.
Lansing, MI 48906

Montcalm Community College
Sidney, MI 48885

Detroit Institute of Aeronautics
Willow Run Airport
Ypailanti, MI 48197

Van Dusen Airport
Avi. Main. Train. Facility
34th Ave. S. at 63rd
Minneapolis, MN 55450

Minn. Area Voc. Tech. Inst.
5810 34th Ave. S.
Minneapolis, MN 55417

Winona Area Tech. School
1250 Homer Rd.
Winona, MN 55987

Theif River Falls Area Tech.
School
Theif River Falls, MN 56701

North County Tech. School
1700 Derhake Rd.
Florissant, MO 63033

Maple Wood Community
College
2601 NE Barry Rd.
Kansas City North, MO 64156

Aero Mechanics
836 Richards Rd.
Kansas City, MO 64116

Golden Triangle
Voc-Tech. Center
Aviation Facility
P.O. Box 789
Columbus, MS 39701

Wayne Community College
Caller Box 8002
Goldsboro, NC 27530

Piedmont Aerospace Institute
Dept. of Piedmont Avia. Inc.
Smith Reynolds Airport
Winston-Salem, NC 27102

Teterboro School of Aero.
80 Moonachie Ave.
Teterboro Airport
Teterboro, NJ 07600

Eastern New Mexico University
Roswell Campus
P.O. Box 6761
Roswell, NM 88201

Southern Neveda Voc-Tech Center
5710 Maple Rd.
Las Vegas, NV 89120

Nassau BOCES
610 Hicksville Rd.
Bethpage, NY 11714

Technological Center
Grand Blvd. & Lucon Drive
Deer Park, NY 11729

Aviation High School
36th St. & Queens Blvd.
L.I.C., NY 11101

Academy of Aeronautics
LaGuardia Airport
Flushing, NY 11371

BOCES Westchester County
17 Berkley Drive
Port Chester, NY 10573

Columbus Technical Institute
550 East Spring Street
P.O. Box 1609
Columbus, OH 43216

Cincinnati Technical College
3520 Central Parkway
Cincinnati, OH 45223

Montgomery Co. Joint Voc. School
6800 Hoke Rd.
Clayton, OH 45315

Macomber Vocational Tech.
High School
1501 Monroe Street
Toledo, OH 43624

Poster Estes Area
Voc-Tech Center
4901 S. Bryant
Oklahoma City, OK 73109

Quaker City School of Aero
2563-69 Gray Ferry Ave.
Philadelphia, PA 19146

Upper Bucks County Area
Voc-Tech School
Box 392, Old Milford Sq. Rd.
Quakerstown, PA 18951

Pittsburg Inst. of Aero
Allegheny County Airport
W. Mifflin, PA 15122

Trident Tech. College
P.O. Box 10367
Charleston, SC 19411

Florence Darlington
Technical College
P.O.Drawer 8000
Florence, SC 29501

Moody Aviation
Moody Bible Inst. of Chicago
Box 429, Muncipal AP
Elizabethton, TN 37643

Memphis Area Voc-Tech. School
Aviation Division
2752 Winchester Rd.
Memphis, TN 38116

Texas State Tech. Inst.
Mid-Continent Campus
P.O. Box 11035
Amarillo, TX 79111

Skyline High School
Career Dev. Center
7777 Forney Rd.
Dallas, TX 75227

Tarrant County Jr. College
Aero-Tech. Dept.
4801 Marine Creek Pkwy.
Ft. Worth, TX 76170

Dean Voc. Tech. Ed.
Houston Community College
4310 Dunlavy
Houston, TX 77006

Texas State Tech. Inst.
James Connaly Campus
Waco, TX 76705

Clover Park Voc-Tec
Institute
4500 Steilacoom Blvd. SW
Tacoma, WA 98499

South Seattle Community College
6000 16th Ave. SW
Seattle, WA 98106

Everett Community College
2915 112th SW Bldg. 512
Everett, WA 98204

Milwaukee Area Tech. College
South Campus Center
6665 South Howell Ave.
Oak Creek, WI 53194

Blackhawk Technical Institute
2228 Center Ave.
Janesville, WI 53545

Gateway Tech. Institute
3520 30th Ave.
Kenosha, WI 53141

APPENDIX C: Written responses to question no. 25

I. Ratings/Certification

1) Item 2: Avionics & helicopter training should be additional.

2) Additional ratings are not needed if curriculum is modified to require more emphasis on these areas.

3) Section II (2): Employers offer additional training in this area. Employee receives specialized training and ratings within the company on the company's particular equipment.

4) Add propellor and avionics ratings rather than just repairmen certificates.

5) Face up to the fact that the industry needs a formal apprenticeship program following graduation. The A&P grad is not a journeyman mechanic. We have advanced ratings for pilots who master additional skills and machinery-- we need to have a similar system for mechanics.

6) Avionics certificate is needed.

7) Certification needed for small vs. large airplanes, also helicopter and propellor.

8) Separate rating for instructors of A&P.

9) Ratings are the big change I would like to see. Ratings-- specialized ratings are needed, but I think they should be on the order of:

helicopter (rotocraft)
single engine/gliders
small multi-engine
large multi-engine--piston-powered
large multi-engine--turbine-powered
balloons/etc.

Obviously, this would affect the smaller schools (in particular) depending on how it is handled, but, I think it is necessary and coming.

II. Testing: Oral, Practical Procedures, Exams

1) A different way of school evaluation by the FAA. The "cram courses put the norms out of perspective. They are producing A&P's who are unqualified. Maybe the acceptable experience of 147 should be reevaluated. I know of people who write their own work history.

2) Closer control over activities of DME.

3) All FAA testing for graduates of certificated schools should be eliminated; the schools should be able to issue the license for the following reasons: (1) Those taking the tests on military time or experience meet no specific curriculum requirements. (2) Publishing the FAA test questions has raised the national passing average from 50% to 85%, not better instruction, just a better pass rate--makes a farce out of written tests. (3) The practical test in most cases just makes money for the DME. It also makes no sense for me to give a practical test to one of my students that I have instructed and tested for a year.

4) I think the new oral and practical exams have caused a "watering down" of mechanical evaluations. The potential for using "many" (43) "mickey mouse" projects is very strong so that the exam can be finished in a reasonable time.

5) If it can be adequately demonsrated to the FAA that the oral and practical projects required and performed in the curriculum can meet the requirements of the oral and practical projects in the FAA oral and practical exams, then the FAA oral and practical exam should be waived for school graduates.

6) 147.38a: This requirement forces a school to play a numbers game. Too much emphasis placed on the written, too little on performance and application. Recommendation: Eliminate the written test portion completely.

7) 147.38: The factors used for "Quality of instruction" should not utilize passing norms as the sole method in determining quality of instruction.

8) The general section written examination (FAA test) should be given separately. The students should not have to qualify for Powerplant or Airframe to be allowed to take the general section test. Once the students have completed general work, a certificate could be issued allowing them to write their general exam prior to enrolling in either the airframe or powerplant curriculum.

9) I also believe one of our biggest problems in training A&P's is the fact that we are saddled with an obsolete (and partly incorrect) FAA witten exam that we try to prepare our students for, when we should be providing more practical and up to date information.

10) Structures: New materials and techniques are better and are not covered by FAA examination.

11) Don't need to have so much on A.C. electricity in exams.

12) Allow for mandatory aptitude testing for any individual wishing to attend certificated A&P school.

13) Change the testing requirements to allow a student to be tested in oral and practical subject areas as the classes are completed, not having a student wait a year or more out of the subject prior to meeting the old 400 hour plus 750 hour either airframe or powerplant completion.

14) Testing of technician applicants should be made more difficult, particularly in the practical test. Practical test requirements should be tightened up and written testing should be turned over to FAA approved private companies or schools. This would allow for privacy of test materials which would result in revalidation of written exams.

15) We (schools) are required to teach outdated methods and information just to pass the test.

16) The test grade should be done away with ...

17) The norms are now a farce; anyone with average intelligence can memorize the questions and score very high on the FAA written exams. The Norms are no indication whatsoever of the quality of a school's instruction.

18) An industry review of the FAA questions should be mandatory--eliminate ambiguity of some answers.

19) In the case of high schools with FAA approved A&P programs, the general section of the FAA written test should be allowed to be taken at completion of the general portion of the curriculum. If the student completes the general portion of the curriculum in the 10th grade and then has to wait until completion of the Airframe or Powerplant curriculum one year (11th grade) or in some cases two years (12th grade) prior to taking the general test, it will obviously place an undue burden on the student. The hardship of retention of the technical knowledge in the general curriculum, while not being actively engaged in the study of the general curriculum, places an excess strain on the student to study and review the general section prior to taking the FAA general portion of the exam.

III. Allen Study/Curriculum: Hours, Content, Intent

1) The "trained" student requires more training time.

2) The basic requirements for the mechanic training should be a joint industry/FAA parameter input (item 19).

3) The required change cannot be a total government program.

4) Allow schools the flexibility to make improvements in curricula as required by changing technology; i.e., decrease instruction in wood and fabric techniques and begin instruction in composite material work.

5) Appendices C & D: Teaching levels need much revision.

6) Basic standards, but with flexibility to compliance of the amount of materials required for lab activities. Make it effective, valid, but not wasteful (financially).

7) Schools that are meeting spirit and intent of present FAR 147 are turning out an adequate "beginning" A&P mechanic.

8) Let's do what we're doing now, but do it better.

9) I doubt seriously that any major overhaul of Part 147 is needed. Schools should be able to easily work within Part 147 guidelines to up-date their needs as necessary.

10) A graduate from a Part 147 school is not and never was intended to be a journeyman level mechanic. He is really trained to a point of apprenticeship ready to continue with industry and learn more about the specific job. It would be very difficult for Part 147 schools to meet all of industry's specific little needs. Also, I'm not sure that additional ratings are necessary. It would probably just confuse an already confused situation.

11) I had input into the Allen Study in 69--It may not be utopia, but I believe they are working parameters.

12) Time requirement is not needed--competency should be the determining factor, not how much time is spent. Define an "hour" of instruction. Time requirement should allow "plus or minus."

13) One of my basic questions is whether or not the FAA should be the standardizing agency rather than an "in-house" organization similar to ATEC.

14) In general, subject matter is ok. What is needed is a change in emphasis relating to certain subject areas; i.e.: A/C turbines, wood structures, etc.

15) I think the Allen study stinks. It is outdated. FAA in our area does a very good job as far as our school is concerned. We are now in the process of getting powerplant approval and plan on using Aviation Maintenance Publishers' powerplant program.

16) In general, the classifications are about right. Some minor changes can be made with the approval of the local FAA without changing the regulations.

17) Appendices B, C & D need to be updated (the obsolete sections removed and new technology added).

18) The aircraft industry (mfgr., F.B.O. business aviation and airlines), the approved schools, and the FAA should reach a concensus on the A&P curriculum. The approved A&P school should be allowed to specialize for specific markets and so plan their curriculum to meet these goals-- The school must advertize their specific area of expertise. Keep regulations and requirements to a minimum to allow maximum training flexibility. The 1900 hours should not be shortened. There should be a provision that students with exceptional ability could progress without the clock hour requirements. Some can be trained in much less than 1900 hours, others require more. Reference question 3, exceptional student should not be tied to a specific number of hours training.

19) The instructional requirements for A&P mechanics should be specified by the aviation industry, FAA and aviation maintenance schools working together.

20) Not without input from industry and FAA. Eventually each school would teach what it thought best. Certainly schools attempt to keep up with industry, but a school would reflect its own ideas and interpretation of the A&P technician if there was no outside input.

21) The Allen Study was a first-time in-depth study. Certainly such a study is not required again in 12 years.

22) The Allen Study was good but, the District and Local GADO still had their own interpretations of it and the 147. Another study or change to the 147 would still result in the same. Even course titles are not the same in all schools. As it is now, we can add any subject and hours if we desire without a full formal inspection or approval. For this reason we would like to see the 147 remain the same and continue to work within the local GADO.

23) Suggest FAA does their own survey of the A/C industry to see what they need.

24) Item 3: General curriculum calls for 400 hours, not 1900 hours. 1900 is total for A or P.

25) Relates to 14 above. The A&P mechanic is generally qualified for today's aircraft. "Today's aircraft" must include all aircraft flying. The new graduate is not adequately qualified for the Boeing 767; however, he has generally demonstrated an ability to readily learn such knowledge. Example: Piedmont Aviation just worked on a DC-2 and a Spartan Executive.

26) The curriculum minimum requirements as listed are minimums. The exact length of time devoted to each subject and thus the emphasis on that subject is determined by the approved curriculum for each school. Thus the FAR's provide almost as much flexibility as needed at this time.

27) This relates to Question 1b, a reasonable period is four years.

28) The FAA inspection is definitely needed. A formal inspection should not be necessary more than once per year with informal

inspections in between. More importantly, FAA should coordinate and observe accreditation visits by state offices and professional accrediting associations such as NATTS and Southern Association of Colleges.

29) Part 147 will do the job as is, but should be looked at and updated with an eye to future needs of the industry.

30) The present 147 allows for the instruction of basic work skills. When students have met acceptable job skills, it is time for them to go to industry for their growth as a workman. As the egg matures, it hatches and becomes a bird--The student leaves school with an apprenticeship level of learning and must exert time and effort to become a journeyman and skilled in his specialized work area.

31) Suspend the makeup requirement for students attending certificated A&P schools.

32) Allow for organizations such as ATEC to provide continuous updating of Aircraft Technician curricula to keep pace with industry and the FAA.

33) If some type of change or updating does not take place in the next 5 to 10 years, industry will lobby to replace certificated mechanics with repairmen whom they will train in-house to meet their individual needs. A situation such as this will be detrimental to aviation as a whole.

34) Adherence to curriculum should not be so positive. 147 is now too rigid, more flexibility needed.

35) GADO to GADO interpretation of part 147 needs standardization. (i.3) Does a level 2 subject such as jet engine (operable) as part of the school's equipment? Wouldn't simulators or trainers suffice? Safety would be increased. Cost of operation and maintenance decreased.

36) Remove the time requirement to the curricula and adopt a competency-based curricula.

37) I feel the way Part 147 is set up at present is ok if the FAA

wasn't so difficult to deal with. Also military evaluation is becoming more and more difficult. How much does his (the Military man or woman) experience count?

38) Part 147 is basically minimum requirements and I'm not in favor of more restrictive regulations. I believe it (Part 147) allows adequate latitude for schools to turn out a quality product if they wish to and also restricts "fly-by-night" operations.

39) Curriculum must be regularly updated to encompass new technology and to eliminate outmoded methods.

40) Required hours are too long--skill building is only found in a few areas, leaving excessive shop time.

41) Time keeping by the hour is not meaningful. Would rather see proficiency.

42) Much curriculum revision could be done by changing the levels of instruction.

43) Teaching levels do not reflect true industry needs or desires.

44) Minimum curriculum hours are not sufficient to instruct students adequately.

45) A&P schools are at best training ground for very basic mechanics skills. Students leave with a license to continue to learn.

46) An FAA study similar to the Allen study could pin point some areas that need to be improved on or deleted.

47) Recognition of different types of schools, different course structure, etc. that may not require x hours to reach a high level of competence. I notice throughout your questionnaire references to the "1900 hours." This, I believe, should become a guideline, not mandatory. As you well know, not all students are capable of covering the same material in the

same length of time. If all that is to be covered in the curriculum is basic requirements to pass the exam, 1900 hours should be sufficient for the average student. However, not all schools deal with the same quality of students--and 1900 hours may not be sufficient.

48) I feel FAR 147 by itself, other than some wordage, is not that much in need of change. I do feel that AC65-2D needs revision. I think if each school could interpret FAR 147 for itself, we could provide for the student what we feel is most important to him as well as to the industry.

49) Curriculum Subjects need constant review--shold have flexibility to change when needed, but stability to allow schools to "manage" their curriculum. Please keep in mind that the FAA is charged with setting minimum standards. A change in FAR 147 by itself is not the answer. I strongly feel that the concept of the all-around "A&P", knowing and doing everything is the problem. Additional ratings, endorsements, specialty areas or what have you, need to be incorporated into Part 65. The schools could then teach a "general" curriculum (which I feel they are now doing quite well) and go into depth in the specialty areas they choose or the industry needs.

50) The hour figures need to be put on a performance level. What many do not realize is the broad range of student types and learning abilities in the various types of schools.

51) A review of the assigned levels--How practical are these? Can some items really be taught to level 3 or does it take a year or two of experience?

52) Appendices B,C, & D should be reviewed periodically to adjust to the changing technology in the field.

53) Question 1: Should not be required to apply for reapproval.

54) Allow the schools to establish the teaching levels based on program equipment which by far exceeds the Doctor Allen Stuiy of the past.

55) Increase min. hours--it seems that 1900 hours was intended for high schools and two-year college courses.

56) Permit schools to make changes and get local FAA approval as needed. This brings about closer relationship with local FAA.

57) The FAA is a response agency. The current curriculum reflects pre-world war I and world war II aircraft.

58) You cannot legislate quality--give GADO and schools more flexibility: the system need not be complicated; that seems to be the problem at this time.

59) Section III: Should be changed to require a minimum time of 2200 hours. See comments relating to subject changes.

60) Appendix D: Item one (1) Dr. Allen's requirements are entirely too many clock hours.

61) Comments other: I do not believe we need a whole-scale revision of Part 147 of the FAR's at this time. I am quite confident that if the changes I have suggested are implemented and all schools use CBE's to meet industry needs, we will have an outstanding training program.

62) The complaints from "some" segments of the industry are unrealistic in my opinion. I look back on my own career as a A/C mechanic. It started in August, 1941, U.S. Navy Aviation. The four months of schooling that I received at NAS Alameda, California, prepared me as an apprentice to hold my own in an operational unit. It was after my initial four months training that I began my climb toward the role of journeyman/technician. My four months of schooling in A/C theory and maintenance gave me the needed foundation upon which to build my career. My teachers were the seasoned mechanic/technicians in the field, the petty officers and chiefs with "experience." You can see where I am leading to ...we in the A&P training business can--in no way--turn out a journeyman A&P. That is not our purpose. We get the student prepared to take his examinations and we turn out an apprentice! The people in the field simply (for economic reasons) do not want to take the time to train the freshly graduated A&P. They expect us to send them a twenty-year-old person with years of experience. Anyone who has been in this business as long as I have knows that experience comes not from 1900 hours of A&P schooling, but rather from turning the wrench and learning from the Senior Mechs. I am sick and

tired of reading articles about how poorly our young A&P graduates perform on the job. I wasn't the greatest A/C mechanic either after graduating from Alameda. But thank God, the petty officers who took me under their wings and showed me the ropes gave me courage and confidence.

I am sure that there are some A&P schools which are not doing the best job possible, but that is the fault of the FAA. Those schools found unsatisfactory should be put on probation or decertified if necessary.

Lastly, if FAR part 147 is revised to require the A&P graduate to be "qualified" to work on today's aircraft, (your item 15, section III), someone had better find a bundle of money so that we tax-supported schools can buy a king air for our students to train on.

63) I think many have lost sight of the true purpose of the A&P school.

64) Ref. 22: The Allen Study is useless as a practical classroom or shop document for schools. It is only good as an administration show and tell. To review FAR 147 obviously is necessary periodically. It really should be an ongoing project. In no way should an impractical project such as the Allen Study be equated to a review of FAR 147.

65) For more optimum instructional and information absorption, the A&P program training day should be 4 hours, but no more than 5 hours.

66) 147.21: Delete any reference to clock hours. Students learn at different rates. If you have a system that can graduate a competent mechanic in 1200 hours and it takes us 2300 hours, more power to you!

67) Decrease the hour requirement; it is far in excess of what is needed to cover the subject areas as listed in part 147.

68) Should be a combined school/industrial/FAA review committee who would periodically update 147 curriculum subjects and their teaching levels.

69) In my opinion, FAR 147 represents generally an adequate FAA

Aviation Maintenance Technician School regulation. The document provides necessary curriculum requirements and subject area scope to ensure solid mechanic basic training. As in any working regulation, there is always room for improvement and review. I do not think we should expand the regulation to provide for specialized training in turbines, helicopters, etc. If we continue to provide solid fundamental training, the specialization will come easily in the field.

70) ...get rid of the Allen Study, or at least update it to meet current industry technology.

71) I think that in 1900 hours there is insufficient time for the necessary theory and shop to give the student an adequate, well-rounded training, so more hours are needed to do the job right.

72) 147.38 (b): A school should be allowed to make curriculum changes without prior FAA approval.

73) Appendices A,B,C &D: curriculum requirements should be determined by the schools in cooperation with industry and should reflect industry's needs. Curriculum should not be established by FAA because: (1) they are not as current on the needs of industry as are the A&P schools; (2) they cannot respond to needed changes in curriculum requirements rapidly.

74) I think the hours of training should be changed to allow a more flexible training program.

75) Airframe systems and components: all areas need updating (including 65-9A, AC65-15A). We need 1970-1980 materials, not 1940-50 materials.

76) Section III, ques. 15: The FAA mechanics school graduate receives a "license to learn." It would be economically unfeasible for a private A&P school to train the student on each and every new aircraft. This should remain the responsibility of the manufacturer.

77) One area that must be enforced in 147 is to make level 3 level 3! Get the schools to decrease a lot of the theory

classroom work and get the student in the shops with wrenches in their hands and not pencils or color crayons. This curriculum review and change of FAR 147 is a must.

78) The control of the existing curriculum is adequate--the problem in our profession is those who subvert the intent of the program to suit economic conditions and satisfy personal views. I don't believe you can make a mechanic by having him fill out endless pages of theory at the expense of real, hands-on experience and that kind of training requires a lot of equipment which will be frequently damaged and worn out, but it should not be possible for a mechanic to be licensed if he cannot perform reasonably in the primary areas of Inspection and Maintenance--telling him about it knowledgably is not good enough--he must have the actual hands-on experience while in training.

79) In the areas of the Airframe and Powerplant curriculum which are closely related and in some cases almost identical (i.e., Airframe electrical systems and Powerplant electrical systems, Airframe and Powerplant fire protection systems, Airframe and Powerplant instrument systems, Airframe and Powerplant fuel systems) there should be flexibility allowed in the individual school curriculum to allow for non-duplication of instructional material. If a student takes (as an example) fire protection systems in the Airframe curriculum, he should not have to take fire protection systems in the powerplant curriculum. The subject of fire protection systems should be detailed enough in both curricula to cover all fire protection systems as related to both Airframe and Powerplant. If the student therefore takes the subject in one curriculum, there is no need to repeat it in the other.

80) I feel we may be in danger of making the A&P license too difficult to obtain due to the time, cost, & extent of knowledge and skill required to just get started. When you couple this with the broad responsiblities, unlimited employer expectations, and low starting pay, it is surprising that we have as many applicants as we do. Perhaps it is time to consider a more limited "basic" license which is easier to obtain and would insure that the mechanic knew his fundamental skills and his many limitations. Routine maintenance & inspection would be included, but fault analysis, overhaul, and high levels of repair skills would not. Ratings could then be added as the mechanic wished. Such things as: wood & fabric, painting & finishing, welding, metal forming & fastening composites, electrical systems,

recip overhaul, fuel injection & turbochargers, turbines, instruments, props, etc. could be earned through schools, experience and testing. Each rating should command a pay increase to reflect the achievement or added responsibility. The "master" mechanic certificate is reserved for those who hold all ratings and would be a goal toward which dedicated professionals could strive. The I.A. could remain essentially the same. It may still be necessary to have classifications within the electronics rating and that track may need its own "master" goal. I believe this approach would also be of assistance to schools in solving problems of equipment modernization, scheduling flexibility, industrial feedback for course updating and image building. It would probably mean more evening classes which means better plant utilization. Instructors need only hold the rating which they teach plus some experience and some training in education techniques.

IV. Teaching: Curriculum, Methods, Class Size, Equipment, Instructors, Length of Class

1) 147.23: 1 to 25 is too large in a shop class and schools use this to limit the number of required instructors.

2) 147.36: same as above.

3) Previous teaching experience should be considered in lieu of courses. Military instructor courses should also be acceptable.

4) I have had strong comments about some instructors being set in their ways and unwilling to change or learn the proper theory. Until an instructor is willing to keep learning he doesn't stand a chance of putting out a qualified mechanic. I think some students or post students of each school should be on the review committee.

5) 147.23: Instructor requirements: 1 instructor for each 25 students in shop/lab classes is not enough to insure proper/safe task accomplishment.

6) Questions, Section III: 147.36: This requirement is theoretically sound, but would eliminate many choices for quality instructors. Especially pertaining to theory classes. Very few teachers in any specialty have had field experience. And very few 10-year mechanics have had education theory courses, yet they tend to be quality instructors.

7) I feel strongly that there is too much emphasis on teaching theory and not enough hands-on lab/shop instruction in present A&P training. A common complaint from industry employers is that new A&P mechanics out of school with no prior aircraft experience, don't know how to do anything on an airplane, and this is because they didn't get much opportunity to do so in school.

8) 147.6a: Should require five (5) years minimum experience.

9) Allow for specialized teachers who do not have A&P license but are expert in their area.

10) Focus on objectives of instruction, don't worry so much about how one gets there.

11) 147.36: The ratio of instructor for each 25 students is too great. A ratio of 15 to 20 to one is more feasible.

12) 147.23: The present regulations require only that an instructor be certified A or P. There should be minimum educational area experience requirements.

13) Instructors serve an apprenticeship.

14) Part 147, or any other type of document that may govern A&P schools, should get out of the 1948-1950 year time frame and get into the time frame of 1985-2000 year times. Our students should have training on current and future equipment, methods, materials, processes, and "state of the art" developments. We have long since passed the days of "wooden propellors," "fabric covered" airplanes, "14 cylinder or larger" radial engines, low frequency range receivers, and the need to weld tubular fuselage together.

15) Broaden the type of acceptable learning modes to include self-paced-- competency-based materials. This would allow standardization and uniformity of instruction at most schools. As per our GADO, lecture is classroom lecture only and cannot be replaced by any other means.

16) Curricula need to be updated.

17) The rigid time requirement dictates spending a proportioned amount of time in lab, teaching subjects like wood and welding which might be better spent in management courses, or helicopter courses, etc. But as long as the FAA test continues to cover those areas in detail, we will have to spend the time. As a result, in order to complete the A&P curriculum in 18 months, important, more complex areas aren't given enough instruction time.

18) Section II (6-13); Section III (2): It might help if the FAA wrote the A&P course curriculum and "lesson plans." This way each school would use the same material and if there were a transfer, the A&P student would fit with another school. Formal evaluation then could be done on a nationwide basis and after reviewed, approved by the FAA.

19) School administrators and older instructors resist change because it will make them learn new things. It only takes about five years for an instructor to lose his understanding of needs of the aviation industry. I am trying to get some curriculum changes to upgrade the powerplant courses, but I am getting some resistance. I am glad your survey is being done because after 12 years of the Allen Study, few schools are working for changes to help students go into industry.

20) The name mechanic should be dropped and the name Technician should be adopted to identify Aircraft Maintenance Technicians. It appears logical that an Aviation Maintenance Technician would graduate only technicians.

21) No school can properly train and qualify an A&P mechanic for all situations and types of equipment. The military has demonstrated the theory of training an individual to work on and maintain one aircraft. This eliminates a need to know many items required for certification. A school could likewise train an individual as a large turbine powered aircraft mechanic for an airline with a different curriculum than that used for A&P certification. Example: there would be no requirement for reciprocating engine knowledge. In accordance with FAA requirements, and industry acceptance of these requirements, a shortage does not presently exist.

22) Do not allow class size to increase to a condition that will compromise lab instruction.

23) The 25 to 1 ratio in lab classes is ridiculous. 20-1 is a little more realistic.

24) Item 5: Instructors should have 10 or more years experience.

25) On Question 5: A&P instructors should have 3 or more years of field experience.

26) Major change to FAR 147 should be in the subject content to stay abreast with "state-of-the-art" aircraft.

27) I would rather not comment on needed changes to 147 above because my reactions would be biased towards the equipment I have available attempting to meet curricula. In a general sense, the industry needs better trained and better equipped mechanics. At the same time--industry must realize that many A&P schools are tax supported which means they do not have the funds to maintain the technology advances of the industry. Specialized training is necessary; however, those people who are making the changes should support all certified schools with materials (new composites) and instructions on how to maintain and repair them. The manufacturers should maintain closer liaison with schools to better acquaint the 147 schools with their products. Bendex and Hartzell are 2 example where they have donated equipment to us that we would have otherwise been unable to purchase. Dope and fabric, wood, etc. should be optional, as special classes not related or required to get A&P licencse. 147 needs to reflect today's industry, not 25 years ago. It also demands more donations from industry to help us survive.

V. Changes to Specific Parts of FAR 147

1) Change 147.15: "Suitable space" issue must be clarified--"Separate space" designated item needs update.

2) Change 147.21: 1900 needs to be changed--50% lab time requirement needs study.

3) Change 147.23: Specialized instructors needs to be expanded to include other areas of specialization: welding, manufacturing processes, corrosion control, metallurgy, etc.

4) Change 147.33: Required records kept needs revision!

5) Change 147.38a: Strike it!

6) Eliminate Appendix "A" and place these definitions with FAR part one.

7) 147.43: omit words "at any time."

8) 147.17 (2): "at least three" versus one aircraft.

9) 147.15: should be totally restructured.

10) 147.15: Omit (f) (1) and restructure "electrical equipment and associated test equipment separate from ignition."

11) 147 (5): Add overload training is permissible with local FAA approval.

12) 147.5 (4): Omit words "at any one time."

13) 147.5 (3): Omit words "...by each."

14) Need a much better definition (complete and specific) of

"check" in Appendix A. Local GADO avionics inspector insists we have $10,000 - $12,000 in avionics test equipment to comply with "check" in 147.

15) 147.21: Advisory meetings with school administrators, instructors and management from all phases of A/C industry should work with FAA to update training requirements.

16) 147.38a: The norm does not indicate quality of instruction because some students will not study even if questions are published.

17) 147.31c(IV): should be dropped.

18) 147.38a: Quality of instruction--measurement should include observation of practical performance.

19) Records--147.33(b): too stringent.

20) 147.11: Schools should be allowed to train repairmen and issue Repairman certificates. They were only issued for one location.

(areas to change):

21) 147.15 (c) (d)

22) 147.21 (c) FAA not to determine levels

23) 147.31 (c) (1) Excl. of (iii)

24) 147.32 (c) (2) Excl. of (iii)

25) 147.38 (a) (b) Should be more flexible

26) 147.38 should be able to change as industry changes.

27) 147.37 changes should be allowed as equipment becomes available.

28) 147.31: military school credit: too loosely interpreted and

not enforced at all. Six and eight week "quickie" "schools" diminish the entire profession and patently unfair to all other applicants.

29) 147.15: Space requirements. The word "suitable" is over used; a more specific size should be given. Example: 100 square feet per student in the laboratory, etc.

30) (areas to change) 147.15 (c) not needed.

VI. Decrease Teaching Levels or Decrease Subject Content

1) Reduce or eliminate wood structures ...

2) Eliminate wood props, reduce instruction on radial engines...

3) No woodwork; no fabric; no welding; ...less recip overhaul...

4) Less emphasis on wood, dope and fabric,...less on welding...

5) Powerplant: Reduce time required in recips.

6) Powerplants: Eliminate radial engine study.

7) Propellers: delete radial engine props.

8) Appendix E: Less dope, fabric, and wood and get into the real world.

9) Decrease wood structures and fabric coverings.

10) Airframe--Too much emphasis on obsolete repair procedures and not enough on sophisticated systems such as environmental, instrumentation, aircraft, etc.

11) Eliminate old curriculum material.

12) Dope and fabric: elective course.

13) Decrease airframe structures, wood, covering, finishes, welding and assembly and rigging.

14) Recip engines: delete radial engine.

15) Aircraft finishes: decrease dope and cotton fabric finishes.

16) D.C. electricity should be de-emphasized somewhat. Teaching level of wood structures, A/C covering and welding should be reduced to level 1. Hours should also be reduced in these areas.

17) Appendix D: Overhaul turbine engines: completely unrealistic. Field situations require the ability to operate the engines, recognition of a hot or hung start and proper abort procedures, and troubleshooting.

18) The other area of my concern is wood, dope, fabric, and welding. This time could be much better spent in other areas which would be more beneficial to students who will become involved in more sophisticated aircraft...as most students will. The elimination of these particular areas would, of course, require many schools to change the emphasis of curriculum and lab priorities and would certainly benefit the student. I would hate to think we are producing technicians for antique aircraft re-building and for skills that are no longer required by the industry.

19) Wood structure: does not apply to most present-day aircraft.

20) Appendix C: Airframe--item 25: delete.

21) Specific reference to radial engines in "recip engines" items 1 and 3 should be eliminated. The reduced use of radial engines should warrant such training as optional.

22) Remove class subjects from 147 that are not of any value to current aircraft maintenance of this era.

23) Eliminate wood work and some covering.

24) Appendix D: Powerplant--item 1: delete. Item 3 delete radial engine.

25) Appendix C (E, Welding) What is the need for items 17 & 18?

25) Appendix D (Item 1) delete 14 cyl radial. Appendix D (Item 3) radial engine ... should be dropped to level 2 or 1.

Appendix D (K, Propellers) Review the scope of this subject, reduce the "Teaching level" of some items or parts of items.

27) Materials and processes basic heat treating requirements should be reduced to level 1. Level 2 no longer relevant.

28) Appendix C should deemphasize wood structures...

29) Appendix D, Part 147. Eliminate: Requirements for "14 cylinder or larger radial engine." Combine Introduction, Cooling, and Exhaust Systems with Basic Engine Theory.

30) Appendix C, Part 147: Eliminate 1. Wood Structures; 2. Aircraft covering; 3. Welding.

31) 147 Appendix C: Wood Structure, all Fabric covering, all level 1; Aircraft finishes all level 1.

32) Appendix C a) Wood Structures; b) Welding; c) Dope and Fabric: decrease the amount of time devoted to these areas.

33) Reduce Dope, Fabric, excessive time spent for value to the student in the market.

34) Appendix D: Engine electrical and instruments should be eliminated and that information to be integrated into airframe systems. Fire protection and detection systems should be part of airframe.

35) Wood Structures should be deleted as a subject area because so few wood aircraft are still flying today.

36) A1: Inspect and repair 14 cylinder or larger radial engine should be deleted from powerplant curriculum because so few engines are in service.

37) F20: Inspect, check and service water injection systems should be deleted from powerplant curriculum because it is obsolete.

38) Much decreased emphasis on radial engines, dope and fabric.

39) Wood structures: not used in modern aircraft; fabric: not used in modern aircraft; welding--too specialized.

40) Delete Radial engine from curriculum.

41) Appendix "C": Decrease welding requirements since most A&P's don't weld.

...eliminate the requirements for pressure carb systems training.

VII. Add Subjects/Increase Teaching Levels

1) Appendix B: Courses in written and verbal communications should be required.

2) Appendix B: Basic electricity and more electronics, much more! Avionics is very rapidly becoming a major area in A&P mechanics. Other items as noted: Appendix C: and initiate composite and bonded construction. Appendix D: ... and start teaching electronic fuel metering and associated devices.

3) ...more sheet metal and composite; more turbine;...more every day practice; require complex aircraft and helicopters where a graduate can make a living.

4) ...more emphasis on composite and laminated structures.

5) ...and increase small recip props and small turbo-prop propellors.

6) Airframe inspection and engine inspection can be combined, along with maintenance forms and records and maintenance pubs into one final practical subject.

7) Inspection blocks should be terminal blocks and made to "put it all together."

8) ...electrical systems, hands on work on real aircraft. Fuel injection systems need to be taught; turbine engines must be taught.

9) Powerplants: ...let's get up to date with supercharged, turboprop and turbine engines.

10) More troubleshooting is needed in all areas. Particularly in Hyd. and elec. Section 12 should include material on aircraft emergency equipment such as life vests, life rafts and escape slides.

11) More turbine and heavier engine electrical is needed.

12) Powerplant and airframe should have follow up electrical after electric is taken in general.

13) More background and familiarization with computerized aircraft maintenance programs.

14) Basic electricity: more schematic reading, trouble shooting, complex circuit analysis.

15) Increase electricity and add some electronics.

16) We need more guidelines on helicopter instruction.

17) ...and increase opposed engines.

18) Better knowledge of electronics, etc. included in Airframe elect.

19) Add an area on plastics and composites to the Airframe structures.

20) Increase basic electricity, math, physics, materials & processes, instrumentation flight and engine, communication and nav system, electrical systems.

21) The above changes are needed to meet the needs of today's aircraft, large and small.

22) Update present materials so that graduate can qualify for a position with numerous aviation firms.

23) Modern Aircraft System & Structures:
1. Composite structures
2. A/C and pressurization systems
3. A/C electrical systems: B757/767

24) Appendix D: Item B should be increased to a minimum of 125 hours and item c doubled to 20 hours, and K include reversible propellors.

25) Appendix B: Items H,I, & J. EIT should be at least doubled over Dr. Allen's report requirements.

26) These hours could be of more use in composite material repair.

27) Mathematics, physics and basic electricity require reinforcement....A/C emphasized much.

28) There should also be included in the program a phase devoted to basic troubleshooting, applicable to electrical systems, powerplants, and any other system. In my opinion, there is no better way to learn and understand a system than by trying to identify and correct a problem in the system. It would teach students a logical, systematic approach to troubleshooting instead of the usual random, shotgun technique commonly employed by most mechanics whereby he replaces components until it works (very costly to the owner).

29) ...increase metal aircraft finishing and synthetic fabric finishing.

30) Basic electricity--electronic components increase and decrease on basic DC and AC problems: Instruments, autopilots and control boxes have many electronic components.

31) ... there should be more training placed on aircraft engines being used today rather than yesterday.

32) We should be teaching the aircraft of today, in particular the structures.

33) The following areas in the powerplant curriculum need to have more emphasis:
1. Modern opposed engine
2. Turbine engines (new compression styles)
3. All phases of Inspection and troubleshooting
4. Turbine ignition systems
5. Turbine fuel systems and fuel control
6. P.S. Series carb
7. Propellers (full feather/reverse hydromatics turbo-props)

34) Turbine Engine: More time should be allowed.

35) Electrical systems: The state of Art of electronics and computors is here to stay and the FAA is at least two decades behind!

36) A basic electronics subject area should be added to the general curriculum (upwards of 40 hours).

37) Entire new concepts of manufacture and repair have to be institutionalized in the area of composite structures.

38) More time should be provided for NDT studies.

39) Gas shielded arc welding should be a major part of the welding

40) Add bonded and composite construction.

41) Turbine engines: increase small turbine and turbo prop engine areas.

42) Sheetmetal: update to modern types of materials and tools.

43) Basic electricity and electrical systems. The understanding of the basic functions of elect. systems would allow better field performance when troubleshooting. Also, this would make training for the more advanced systems (such as electrical-mechanical, processing, servo systems, electronic controls for interior light systems, etc.) easier.

44) More instruction on required hand tools.

45) More emphasis upon general fields: physics, math, etc.

46) ... and add the new materials such as Boron, carbon fiber, Kevlar 49, S-Glass, etc.

47) Add Bonded, composite and "new" materials.

48) (areas to change) Basic electricity--aircraft electrical systems-- Engine electrical systems--change to include current "state of the art" devices, circuitry, computers, CRT, etc.

49) Increase emphasis on Bonded, Structures, Composition materials and related special fasteners. These items increasing in use.

50) Combine position and warning systems with aircraft instruments. Instruments should be expanded to include GYRO systems. Autopilot theory should be integrated with instruments. Ice and rain control systems, fire protection systems should be part of electrical systems. Aircraft electrical systems should be one of the largest areas to be taught and should be itemized similar to aircraft fuel systems but more added.

51) ...and devote more time to bonded structures and electronic components in the aircraft of today.

52) Coverage in electrical areas is insufficient to cover the complex A/C.

53) Coverage in the bonded and composite structures is lacking for new A/C.

54) Due to the nature of current aircraft, turbine engines should be taught in more depth in the laboratory. More laboratory hours are needed in this area of the curriculum.

55) Appendix C II: water/waste is not addressed.

56) Update Instruction on electronics. All aircraft becoming more dependent on electronic equipment.

57) Include more composite material training as a separate section in Airframe.

58) Course on NDT should be included in Airframe.

59) Helicopter training should be included into airframe and powerplant curriculum at a level 2 and 3.

60) Electronic training should be added to the General curriculum because of all the new electronic component used in newer aircraft.

61) Include in the Powerplant appendix more training in Fuel injection systems.

62) Basic electronics; NDT; basic honeycomb; fiberglass composite materials; permanent fluid line joints--"blaze" type, "swaged" types; shop management shop safety; basic communications skills.

63) More emphasis on composite structures.

64) After a visit to Boeing, I feel there should be some introductory courses given in computer operation or programming.

65) More information on bonded and composite construction.

66) More basic and advanced electrical theory. Separate avionics program with some of airframe material (flight controls, navigation, hydraulics, pneumatics).

67) Appendix "B": Revise and enlarge scope, also more hours for basic electricity.

VIII. Miscellaneous

1) Administrators do not understand; they are not FAA minded.

2) FAA should have at least two maintenance inspectors trained in education to inspect schools. GADO inspectors not competent to inspect schools.

3) Someone in the official capacity of school administration should be required to hold at least an A&P license.

4) All answers assume the present certifying structure.

5) I honestly feel that areas of change are well reflected in the questionnaire.

6) AC65 book should be updated.

7) I "strongly disagree" with your comment category "indifferent." I was "undecided" on several of your comments, but I was indifferent to none.

8) To our knowledge, FAR 65.101 has not been changed (item 24).

9) Section III: Item 14: Properly trained should be underlined;

10) Item 15: Schools cannot afford equipment.

11) In addition, I would like to offer an opinion. I feel that there is really not a shortage of A&P's, but the industry retention rate is so poor it always appears that way. The future offers no hope of this changing. In fact, I would predict it to become worse, the hopeless confusion and complexity of AD notes, federal regulations and manufacturers bulletins, coupled with the increasing popularity of liability suits, makes it a high pressure, high risk industry. However, the pay for the assumption of this responsibility is about 60% of a union construction laborer. I feel that ATEC should work to make a change in this

formula. Perhaps a statute of limitations on work performed, pressure on manufacturers and the FAA to organize the AD note system better and stop using it as an umbrella to shield themselves, while putting the responsibility to someone else. I realize this is not a problem that necessarily is ATEC's, but it should concern all of us in the maintenance industry. Someday there will be no students to train; we will have created a job so unpopular there will be no takers.